Inverter Based Resources Requirements and Standards

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Interconnection Analysis

September 26, 2024

Standard IBR Requirements

- **Why does this matter for PJM?**
  - Growing presence of Inverter-Based Resources (IBRs) and the need for consistent requirements.
  - System events such as the 2022 Odessa Disturbance which resulted in a loss of 2,555 MW of total generation have highlighted adverse reliability impacts on the transmission system due to IBR-related issues
  - Anticipation of new NERC standards following FERC Order 901
  - Interest from PJM members based on IBR standards already adopted by other RTOs/ISOs.
- **What does this entail?**
  - Adopting IBR standards such as:
    - IEEE 2800-2022
    - IEEE 2800.2
    - NERC IBR standards resulting from FERC Order 901

FERC Order 901

- Issued October 2023, to direct NERC to develop a suite of new or modified reliability standards to address IBRs
  - Data sharing
  - Model validation
  - Planning and operational studies
  - Performance requirements

Announcement & Order: https://www.ferc.gov/news-events/news/ferc-moves-protect-grid-transition-clean-energy-resources

Date	NERC Tasks
1/19/2024	Submit an informational filing
Nov. 2024	Address performance requirements & require disturbance monitoring data sharing and post-event performance validation for registered IBRs.
Nov. 2025	Address (1) data sharing for registered IBRs, unregistered IBRs, and IBR-DERs in the aggregate; and (2) data and model validation for registered IBRs, unregistered IBRs, and IBR-DERs in the aggregate.
Nov. 2026	Address planning and operational studies.

PJM's Progress

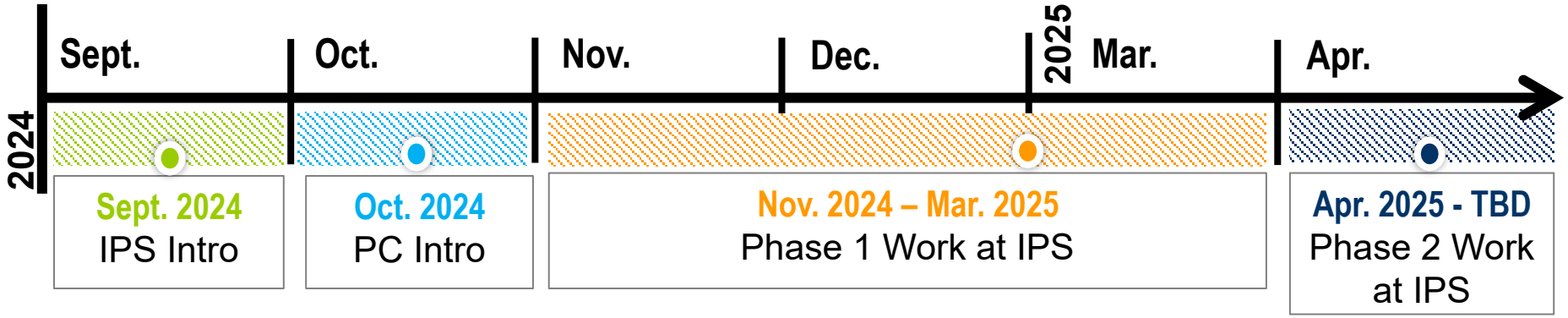
- Performed a gap analysis on where PJM meets or does not meet the clauses outlined in IEEE 2800
- Focused on Section 7 of IEEE 2800 (Ride-through) and PRC-029 which is part of the NERC Order 901 Work Plan
  - Voltage disturbance ride-through requirements
  - Frequency disturbance ride-through requirements
  - Rate of change of frequency (ROCOF) ride-through
- Developed a tentative adoption plan and timeline

Adoption Possibilities

- PJM is likely to make specific clause-by-clause references for IEEE 2800, indicating which clauses will and will not be adopted.
- This approach involves directly referencing clauses (e.g., "PJM will adopt Section X.X of IEEE 2800-2022").
- In some instances, PJM may include additional details or modifications to clauses where necessary.
- Other ISO/RTOs have used detailed reference approach

Anticipated Timeline

- Use adoption plan as a starting point for stakeholder engagement
- Suggested timeline



Phase 1: General definitions, ride-through and associated protection requirements

Phase2: Reactive capability, voltage control, modeling, measurement & monitoring, additional protection requirements

IBR Owner and OEM Impacts

- IBR owners and OEMs may be required to ensure that their IBR equipment complies with technical requirements regarding voltage and frequency control, fault ride-through, and reactive power support
- OEMs may need to upgrade inverter technologies and controls to meet the new performance requirements. This might involve hardware changes or software updates to ensure that IBRs can provide the necessary dynamic performance and reliability
- IBRs may be required to contribute to grid stability and reliability, particularly during abnormal grid conditions. This includes capabilities such as high and low voltage and frequency ride-through capabilities

Key Takeaways

1	2	3
• PJM will be starting a stakeholder issue to address gaps in IBR requirements	• IEEE 2800, FERC Order 901, and resulting NERC Standards will continue to update IBR standards	• IBR owners and OEMs may be impacted to ensure the IBR plant meets the minimum technical requirements based on the updated standards

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